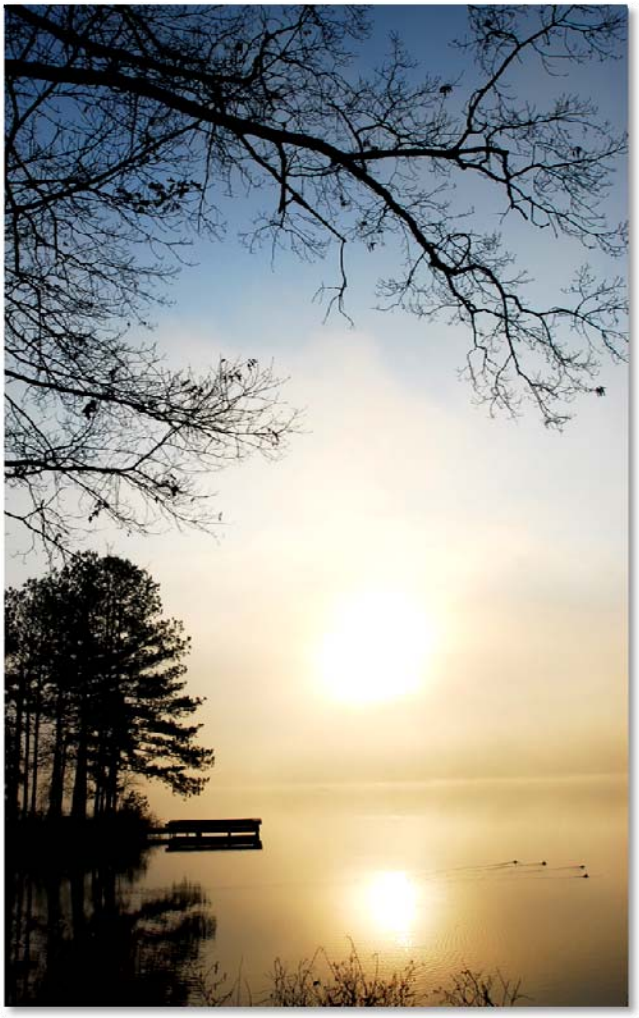
# CHAPTER 9: ENVIRONMENT

## Overview

A wealth of land, air and water resources exists in Chesterfield County, contributing to a high quality of life. These resources are one of many factors which shape development. Innovative designs should incorporate these resources into development to enhance the landscape and community while at the same time accommodating growth and development.



Certain land, air and water resources are protected by federal, state and county regulations. These regulations are designed to protect those resources that provide a significant benefit for citizens. Understanding the benefits of these resources and the regulations affecting them is important to successfully integrate environmental and developmental goals of the Plan. This chapter:

- Provides an overview of land, air and water resources.
- Identifies factors and existing regulations that impact these resources.
- Identifies impacts of these resources on development infrastructure.
- Identifies impacts from former and current uses of these resources.
- Suggests guidance for incorporation of these resources into development.

# Land Resources

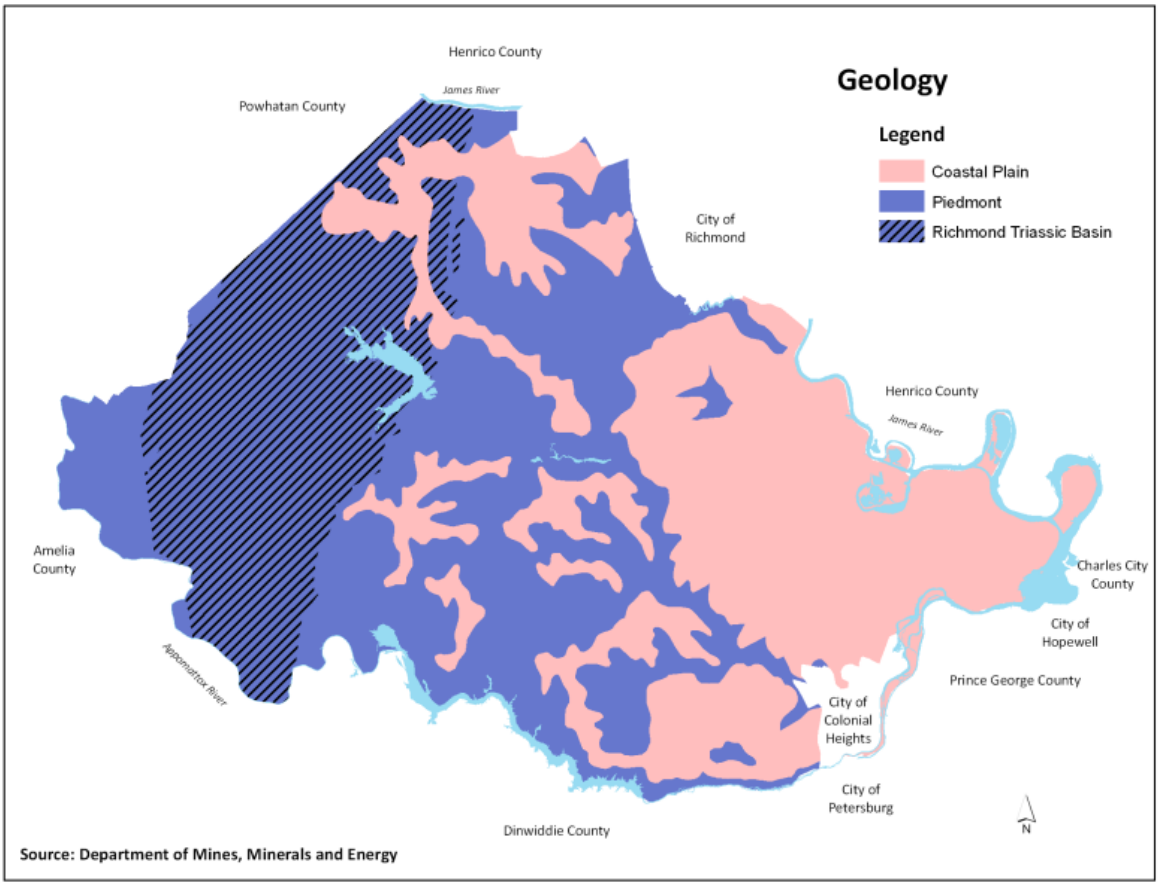
## GEOLOGY, TOPOGRAPHY AND SOILS

The county's terrain rises east at sea level to the west at 390 feet above average sea level.

Soil types can impact building foundations, drainfields, design of drainage systems and the ability to install low impact design features. In addition, wetland areas are generally characterized by hydric soils which are soils formed by periodic or sustained saturation of water. Wetlands regulations impact development design.

Landform regions are areas having similar terrain shaped by a common geological history. Chesterfield County is located in two landform regions, the Piedmont and Coastal Plain. Each of these regions has distinct characteristics in terms of geology, topography and soils. The fall line between the two landforms marks the limits of navigation on the James and Appomattox Rivers and is the approximate location of an ancient shoreline when the sea level was higher than it is today. Steep slopes in both landform regions are subject to severe erosion when disturbed.

The Piedmont landform occupies the largest area of the county, with rolling hills and well-drained soils. An area known as the Richmond Triassic Basin extends into the Piedmont landform and is characterized by soils with the potential to excessively shrink when dry and swell when wet. The Coastal Plain is mostly concentrated in the eastern portion of the county, and is generally flat with moderately to well-drained sandy soils created by the ancient shoreline of the Atlantic Ocean.

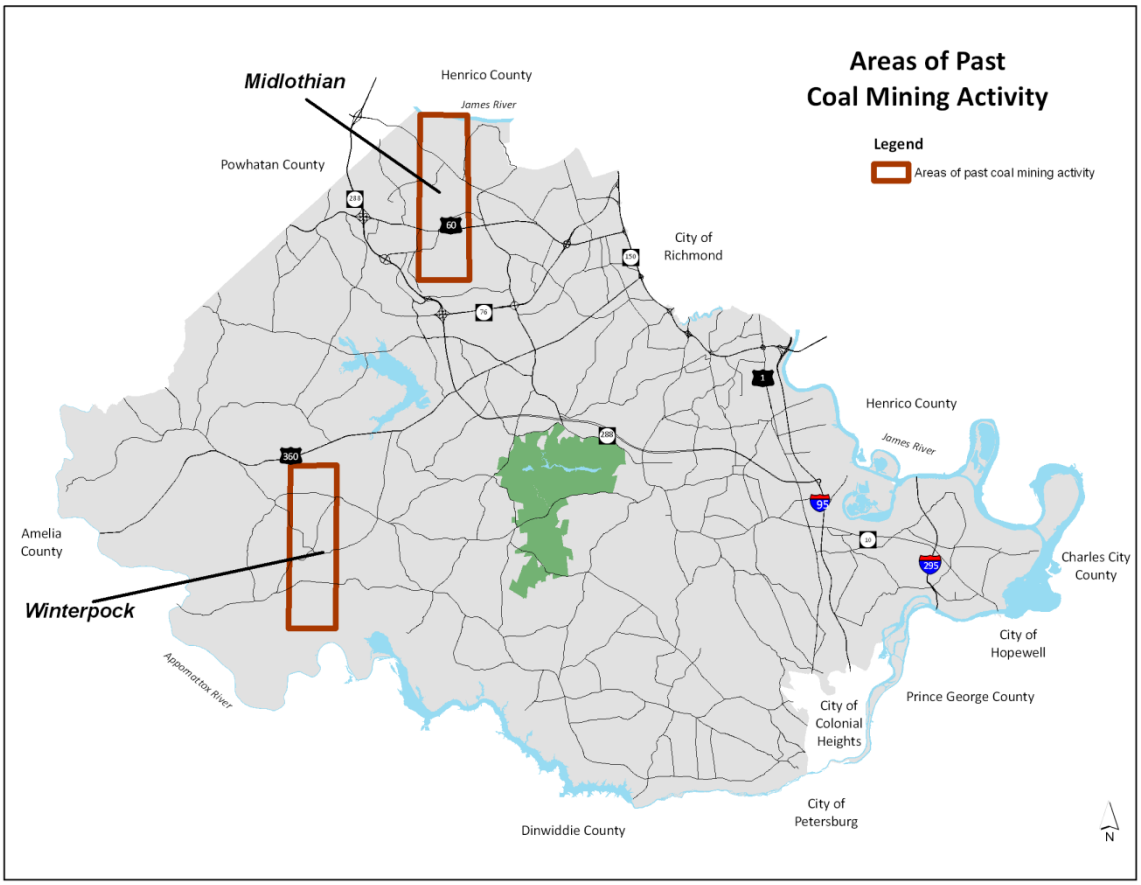


## MINERAL RESOURCES

While the first commercial coal production in America occurred in Chesterfield County, it is no longer actively mined. One of the mineral resources mined in the county today is granite.

### *Coal Mining*

Major coal mining production ceased in 1927, leaving many abandoned mines and shafts in the vicinity of the Midlothian and Winterpock areas.



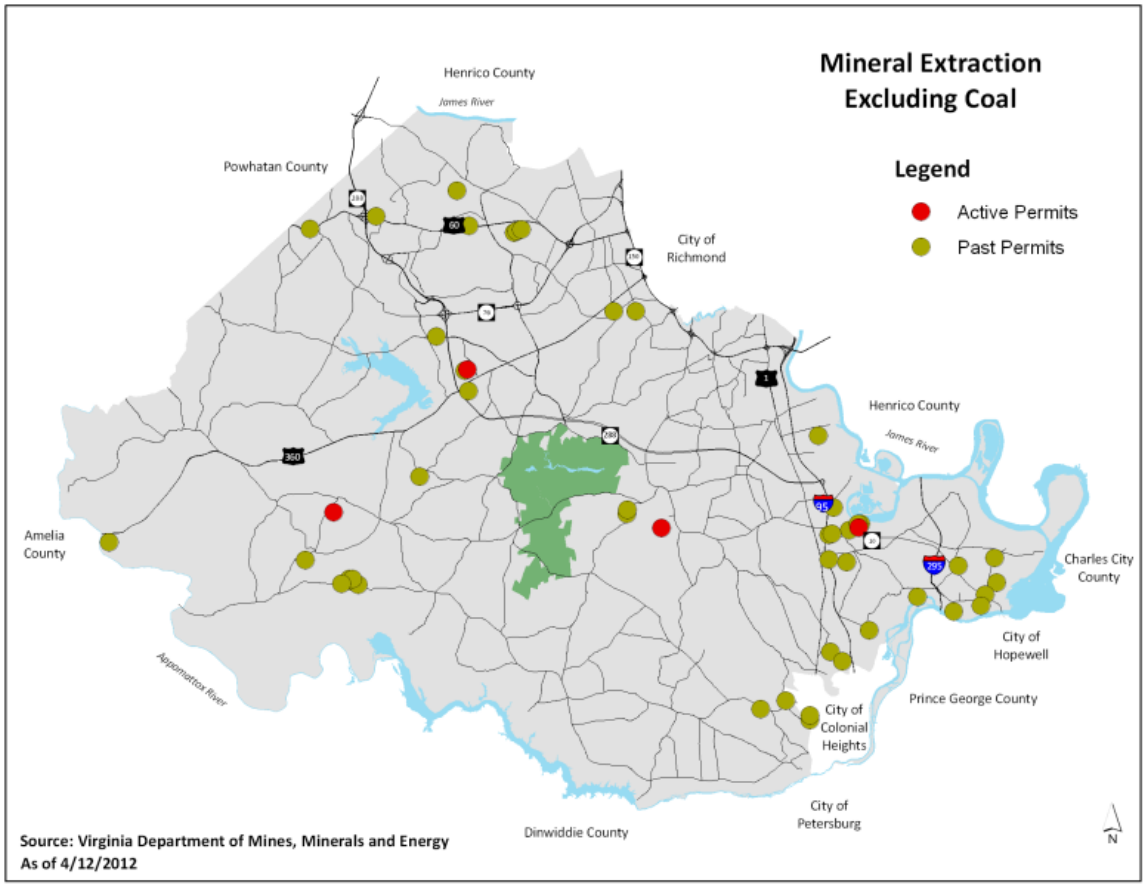

### *Natural Gas Extraction*

Black shale and coal beds exist in the Richmond Triassic Basin and the Dutch Gap area. These areas contain natural gas. In the late 1970's and early 1980's, approximately 20 wells were drilled in the county to test these formations to determine the feasibility of producing natural gas. While several of the exploratory wells were capable of producing natural gas, there was too much water in the wells to make extraction viable. The wells were subsequently capped in accordance with state and county requirements.

***Other Mineral Extractions***

Mining of clay, sand and granite is an active part of the county's economy. Mining industries support development activities. These operations are regulated by the Virginia Department of Mines, Minerals and Energy as well as by zoning requirements. In 2010, these mines employed 31 workers and produced over 919,000 tons of granite at an estimated value of $11.6 million. As of 2012, there were four mine permits in the county from the Virginia Department of Mines, Minerals and Energy. Of the four permits, three mines are active and are producing crushed granite and one mine is currently inactive that formerly produced sand and clay.

Mineral extraction also creates spin-off jobs in transportation and related industries.



## FORESTLAND AND FARMLAND

### *Forestland*

Forestland is defined by the United States Forest Service as land covered by forest trees or land which previously contained tree cover, but is not currently developed. To be considered forestland, the area must have a minimum of one acre, be 120 feet in width, and have at least 10 percent tree cover. These forested acres consist primarily of pines and hardwoods. Over the years, the amount of forestland has decreased primarily due to development. The forested nature of the county provides both an economic and aesthetic benefit. Timber harvesting is an active industry in the county; the value of the timber sold in 2010 was approximately $2.5 million. Timbering activities supply products to regional paper and lumber manufacturers.

Based upon 2010 information from the Virginia Department of Forestry:

- Approximately 150,000 total acres of forestland (52%of the county's land area) exists in the county.
- Approximately 133,000 acres of the total acres in forestland (47%of the county's land area) are privately held.
- Of the 95 counties in Virginia, the county ranked 35th in value of timber sold and 24th in terms of volume of timber cut.

### *Farmland*


The United States Department of Agriculture's Census of Agriculture defines a farm as any place from which $1,000 or more of agricultural products is produced or sold per census year. There is no definitive source of information regarding the total number of farms and the amount of acreage actively farmed in the county. Farming information can, however, be derived from a variety of sources such as the Census of Agriculture, the county's Land Use Program and the James River Soil and Water Conservation District.

In 2007, the Census of Agriculture reported that county farms generated approximately $1.2 million. It is also worth noting that farmer's markets are becoming increasingly popular in the county. Further, opportunities exist for the partnering of area farmers and food manufacturers to grow and produce food within the county.

Based upon 2007 information from the Census of Agriculture:

- Approximately 6,500 acres are dedicated to cropland farming (2% of the county's land area) producing mainly soybeans, wheat, squash and corn.
- Livestock production is active and includes cattle, chickens, turkeys, goats and hogs. The amount of land in this category is unknown.
- Other farmland activities focus on equestrian boarding and training, orchid and nursery production, and vineyards.

As of 2012, approximately 3,600 acres of farmland (agriculture and horticulture) properties are enrolled in the county's Land Use Program. This program is explained below.

### ***County Land Use Program - Existing Incentives for Forestland and Farmland Preservation***

As of January 2012, approximately 60,000 acres of forestland and farmland (21% of the county's land area) were included in the Land Use Program. This voluntary program was established by the ***Code of Virginia*** to "promote the preservation of land for public benefit." The program provides tax relief to landowners whose property meets certain size criteria, and is used for agricultural, horticultural, forestal and open space uses. A landowner pays taxes on the assessed value of the land based on use rather than market value. At such time as the property no longer qualifies for the program (such as the land ceases to be in production or is rezoned to a non-agricultural classification), the property owner is responsible for payment of a rollback tax. The rollback tax is calculated as the difference between the fair market value tax and the land use tax for a period comprising the current year and the five previous years, plus interest.

## CONSERVATION LANDS

Approximately 16,000 acres (6% of the county's land area) are owned by local, state and federal governments for parks and research lands or is in conservation or open space easements. The character of these areas varies from woods and wetlands to active playing fields.

### ***Parks***

Chesterfield County is home to Pocahontas State Park, the largest state park in Virginia, comprising nearly 8,000 acres; as well as three federal parks totaling 1,400 acres. These federal parks include Presquile National Wildlife Refuge, and two areas within the Richmond National Battlefield Park System, Parker's Battery and Drewry's Bluff. The county owns numerous regional, community, neighborhood and special purpose parks providing both passive and active recreational opportunities, comprising 4,500 acres. The county park system is discussed in more detail in The Public Facilities Plan chapter.

### ***Research Lands***

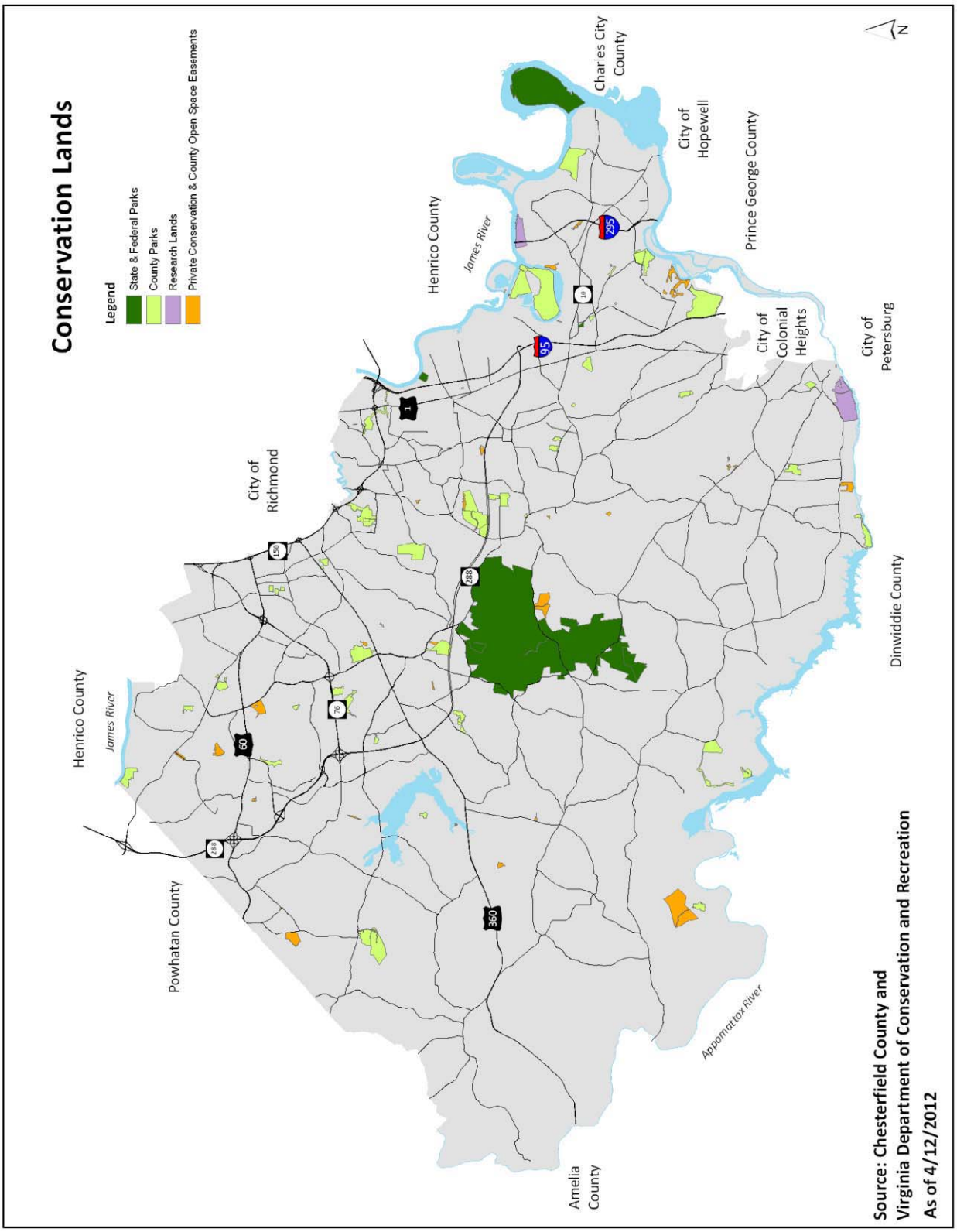
State universities own property used primarily for agricultural and environmental research. There are two of these areas in the county. The 400-acre Randolph Farm is an agricultural research facility operated by Virginia State University (VSU) and located in Ettrick, along the Appomattox River. Virginia Commonwealth University (VCU) owns 140 acres of property adjacent to the James River, in the Meadowville area. The Virginia Commonwealth University property is an extension of the VCU Rice Center for Environmental Life Sciences, located downriver in Charles City County. The VCU Rice Center specializes in river ecology studies.

### ***Conservation and Open Space Easements***

Landowners benefit from federal and state tax programs by voluntarily placing conservation and open space easements on their property. Conservation easements are an agreement between a landowner and a qualified land protection organization, often called a land trust. Open space easements are an agreement between a landowner and a local government.

These easements protect land in perpetuity from future development. A landowner enters into agreement with an organization to hold the easement which is recorded with the property deed and runs with the land. Easement agreements vary from property to property. The use of the property is limited, but continued farming and forestry operations are generally allowed.

Approximately 1,700 acres of private land is held in conservation and open space easements in the county. Of the county's 4,500 parkland acres, approximately 900 acres are held in conservation easements. In addition to easements, some parkland is protected by deed restrictions and covenants.


Conservation Lands
Legend
State & Federal Parks
County Parks
Research Lands
Private Conservation & County Open Space Easements
N
Charles City County
City of Hopewell
Prince George County
Henrico County
James River
City of Richmond
City of Colonial Heights
City of Petersburg
Dinwiddie County
Henrico County
James River
Powhatan County
Amelia County
Appomattox River
Source: Chesterfield County and Virginia Department of Conservation and Recreation
As of 4/12/2012

### NATURAL HERITAGE RESOURCES

The *Virginia Natural Area Preserves Act* defines natural heritage resources as "the habitat of rare, threatened, or endangered plant and animal species, rare or significant natural communities of geological sites, and similar features of scientific interest." The Virginia Department of Conservation and Recreation's Division of Natural Heritage and the Virginia Department of Game and Inland Fisheries document natural heritage resources.

When permits are required to disturb wetlands, developers are currently required to provide an inventory of the site's natural resources in conjunction with the permit application. Through the state and federal permitting processes, determinations are made as to what measures, if any, must be taken to protect any identified resources. The Virginia Department of Environmental Quality and the United States Army Corp of Engineers regulates impacts to wetlands. The Virginia Department of Game and Inland Fisheries and the Virginia Department of Conservation and Recreation's Division of Natural Heritage function in an advisory role, providing information about rare, threatened and endangered species during the permitting process.

## Impacts of Land Resources on Development Infrastructure

### FOUNDATIONS

Building foundation designs can be impacted by soil types. The Department of Building Inspection addresses building foundation designs in areas with soils that shrink when dry and swell when wet.

### PRIVATE INDIVIDUAL ON-SITE WASTEWATER TREATMENT

Soils affect the ability to install drainfields for conventional private individual on-site wastewater treatment facilities. Installation of a private system must be approved by the Chesterfield Health District. In most instances, the county requires a minimum lot size of 40,000 square feet for the installation of a private individual system.

The eastern area of the county is generally suitable for the installation of conventional septic systems. Soils in the western area of the county, especially in the Triassic Basin, are generally unsuitable for conventional systems. Where soils are not suitable for conventional systems, alternative on-site septic systems may be installed. These alternative systems process waste for an individual residence.

Approximately 21,500 county residences are on a private individual conventional septic system. The average lifespan of a conventional system is 35 years. The county requires that these systems be pumped out every five years. Current regulations require sufficient acreage and soil conditions that can accommodate a reserve drainfield for a conventional system.

Approximately 500 county residences are on an alternative on-site septic system. An alternative on-site system does not require as much land area as a conventional system. The initial cost for installation of an alternative on-site septic system is higher than that of a conventional system because each individual system must be designed by a professional engineer. Alternative on-site septic systems also have higher annual maintenance costs due to their complexity.

## Impacts of Specific Land Uses on Land Resources and Development

Existing and new development can be impacted by activities that use, or have used, land resources. These activities include coal mines, mineral extraction and landfills. When abandoned and reclaimed, some of these areas also have the potential for adaptive reuse.

### COAL MINES

The Virginia Department of Mines, Minerals and Energy manages an Abandoned Mine Lands program to assist in locating and characterizing the hazards associated with abandoned coal mining activities.

Development in the vicinity of abandoned coal mining activities must be sensitive to the potential existence of shafts which can cause sink holes in the earth. Therefore, careful attention must be given to the placement of structures in relationship to past mining activities.

The Department of Environmental Engineering maintains maps showing approximate locations of abandoned mines and shafts. The Department of Environmental Engineering uses this information when reviewing development proposals in the vicinity of past coal mining activities and makes recommendations accordingly through the development review process.

### NATURAL GAS AND OTHER MINERAL EXTRACTIONS

The Virginia Department of Mines, Minerals and Energy and the county's development review processes regulate mineral extraction activities. While extractions provide an economic benefit to the county, the activity can impact nearby land uses.

Impacts and reclamation of extractions are addressed through the development review process. Impacts from active operations could include dust, noise and vibration from blasting and crushing. Residential uses are especially vulnerable to these impacts. Closed sites should be properly secured and stabilized.

## LANDFILLS

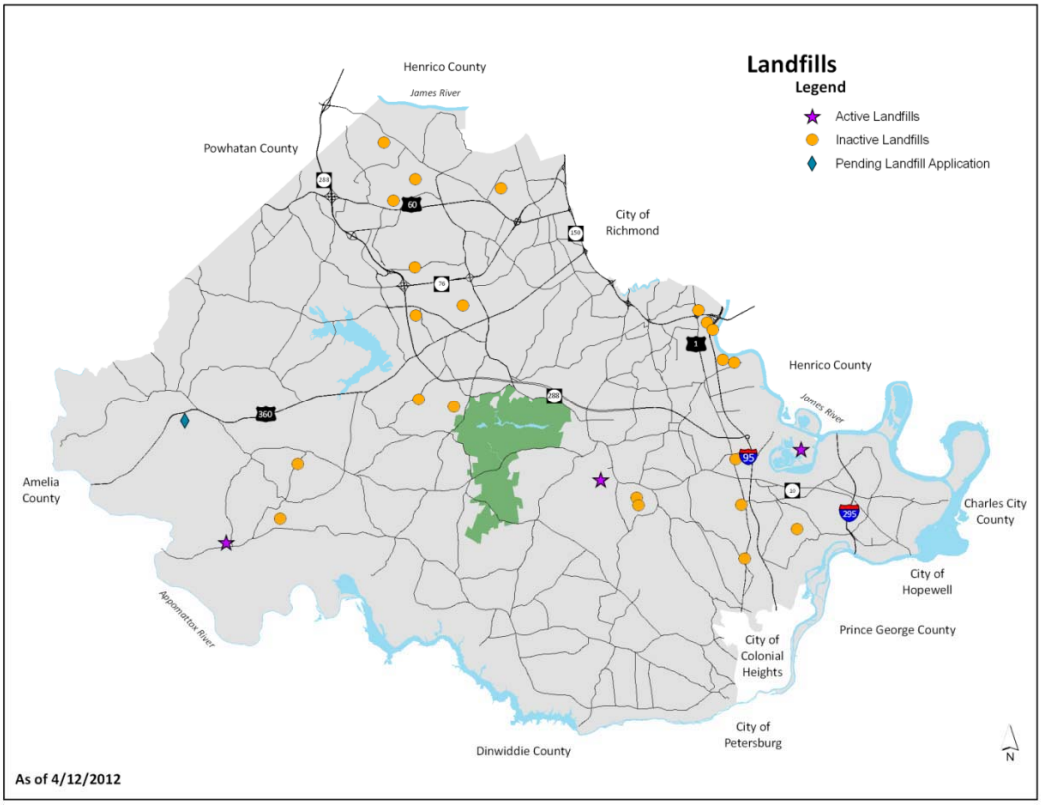
Landfills are sites for the disposal of solid waste and are regulated in their design and operation by the Virginia Department of Environmental Quality. The county also regulates this use through the development review processes. There are two types of landfills:

- Sanitary landfills which accept household, business and industrial waste
- Construction demolition debris landfills which accept land cleared material and construction debris.

Approximately 22 inactive landfills exist in the county, three of which were sanitary landfills. As of 2012, there were three active privately owned landfills: one sanitary landfill located in the vicinity of Iron Bridge and Lewis Roads: two construction demolition debris landfills, one on Taylor Road and one in the vicinity of Dutch Gap.

As of 2012, there is only one other property that is zoned to allow a construction demolition debris landfill. Site plans for operation of the landfill have not been submitted to the county nor have permits been issued by the Virginia Department of Environmental Quality. The county will require compliance with all conditions of zoning. There is a pending application to amend the zoning to allow disposal of fly ash and automobile fluff. The amendment must be considered by the Planning Commission and Board of Supervisors who will determine whether approval is appropriate.

Impacts and reclamation of landfills are addressed through the development review process. Impacts from active operations could include dust, noise and odor. Active and closed landfills can create methane gas and leachate. Residential uses are especially vulnerable to these impacts. Closed landfills should be properly secured and stabilized.



## Air Quality

Air quality is influenced by many elements from a wide geographical range. For example, the air quality of Chesterfield County is affected not only by personal daily actions such as operating a motor vehicle, but also by the emissions of major industries located hundreds of miles away. National Ambient Air Quality Standards are set by the Environmental Protection Agency and air quality is monitored by the Virginia Department of Environmental Quality. Outdoor, or ambient, air is monitored for five pollutants: carbon monoxide, sulfur dioxide, nitrogen dioxide, ozone and particulate matter.

Air quality is measured at a regional scale. The Richmond region includes the counties of Chesterfield, Charles City, Hanover, Henrico, Prince George and the Cities of Colonial Heights, Hopewell, Petersburg and Richmond. Two of the regional monitoring stations operated by the Department of Environmental Quality are located in the county: one at Beach and Spring Run Roads which collects data on ambient ozone levels, and one at the Defense Supply Center on Jefferson Davis Highway which collects data on particulate matter. In 2010, the Richmond region met all ambient air quality standards. However, the Richmond region is considered a Maintenance Area for ozone because it did not meet ozone standards from 2004 to 2007, requiring the state to establish a maintenance plan to meet and maintain air quality standards.

## Noise

Noise pollution is considered unwanted, disturbing, disagreeable or unpleasant sound. There are two types of noise:

- **Background sounds** such as those created by traffic and mechanical equipment
- **Short-term sounds** such as those created by construction, animals, refuse collection, airports railroads and outdoor events.

The Environmental Protection Agency regulates noise sources such as rail and motor carriers, construction equipment, transport equipment, trucks and motorcycles. Noise generation can also be regulated at the local level.

The Land Use Plan considers noise impacts by discouraging incompatible land uses in close proximity. Further, The Land Use Plan discourages residential uses in areas impacted by the Chesterfield County Airport.

The County Code addresses short term noise disturbance such as those from garbage collection, radios, televisions, loud speakers and lawn maintenance. The Zoning Ordinance also addresses potential noise impacts through setback and buffer requirements and, in some districts, limitations on hours of operation. Through the zoning process, conditions may be considered to address the potential noise impact of a specific development proposal.

## Light

Light pollution is the alteration of outdoor light levels due to manmade sources of light. Improperly directed or unshielded light can create a nuisance.

The Zoning Ordinance addresses light pollution, requiring light sources to be directed downward; preventing direct view of sources from public rights of way and residential properties; limiting light intensity; and, in some instances, requiring buffers. Through the zoning process, conditions may be considered to address the potential light impact of a specific development proposal.

## Water Resources

### GROUNDWATER

Groundwater is the water beneath the surface of the earth, and is an important resource for domestic and industrial use. Groundwater is stored and transmitted through underground formations known as aquifers. Wells are one way to remove water from aquifers. Soil, rock and topographical conditions impact the ability and rate of a well to recharge, which is the ability of a well to refill with water.

Aquifers in the Piedmont, Triassic Basin and Coastal Plain have separate and unique characteristics. Generally, wells in the Coastal Plain recharge quickly due to sandy soil conditions, whereas wells in the Triassic Basin do not recharge as rapidly due to rock formations that impede the flow of water into the aquifer. Also, due to rock formations in the Triassic Basin, it is often necessary to drill deep wells and/or to drill at several locations before finding an adequate water supply. In some instances, it is also necessary to have several wells on an individual site to obtain an adequate water supply. Wells are subject to pollution from infiltration of surface water.

Installation of a well must be approved by the Chesterfield Health District. Approximately 9,000 county residences are on private wells. A residential well must yield a minimum of three gallons per minute to meet county requirements. For any newly created parcel, the county requires a minimum lot size of one acre for the installation of a residential well.

### SURFACE WATER

Chesterfield County has 92 miles of waterfront along the James and Appomattox Rivers. Twelve of the 92 miles are along Lake Chesdin, created by a dam on the Appomattox River. Approximately 19 miles of the Appomattox River from the Brasfield Dam at Lake Chesdin to where it meets the James River (excluding the Port Walthall Channel) have been designated by the state as a scenic river. This designation recognizes the natural, scenic, historic and recreational value of this portion of the river and does not imply any land use controls or public access. In addition, thousands of miles of streams

exist in the county, as well as hundreds of lakes and ponds. County surface water drains to the James River, which ultimately flows to the Chesapeake Bay. There may be instances of stream and shoreline erosion. The county addresses these issues through the development process. In addition, the county actively works with property owners to address these issues following development.

Swift Creek Reservoir, a source of drinking water, is a 1,700 acre water amenity. The Reservoir is maintained by the Department of Utilities. More information regarding the Swift Creek Reservoir as a drinking water source is found in the Water and Wastewater chapter.

Lake Chesdin, a source of drinking water, is a 3,100 acre water amenity. The Lake is maintained by the Appomattox River Water Authority. More information regarding Lake Chesdin as a drinking water source and the Appomattox River Water Authority is found in the Water and Wastewater chapter.

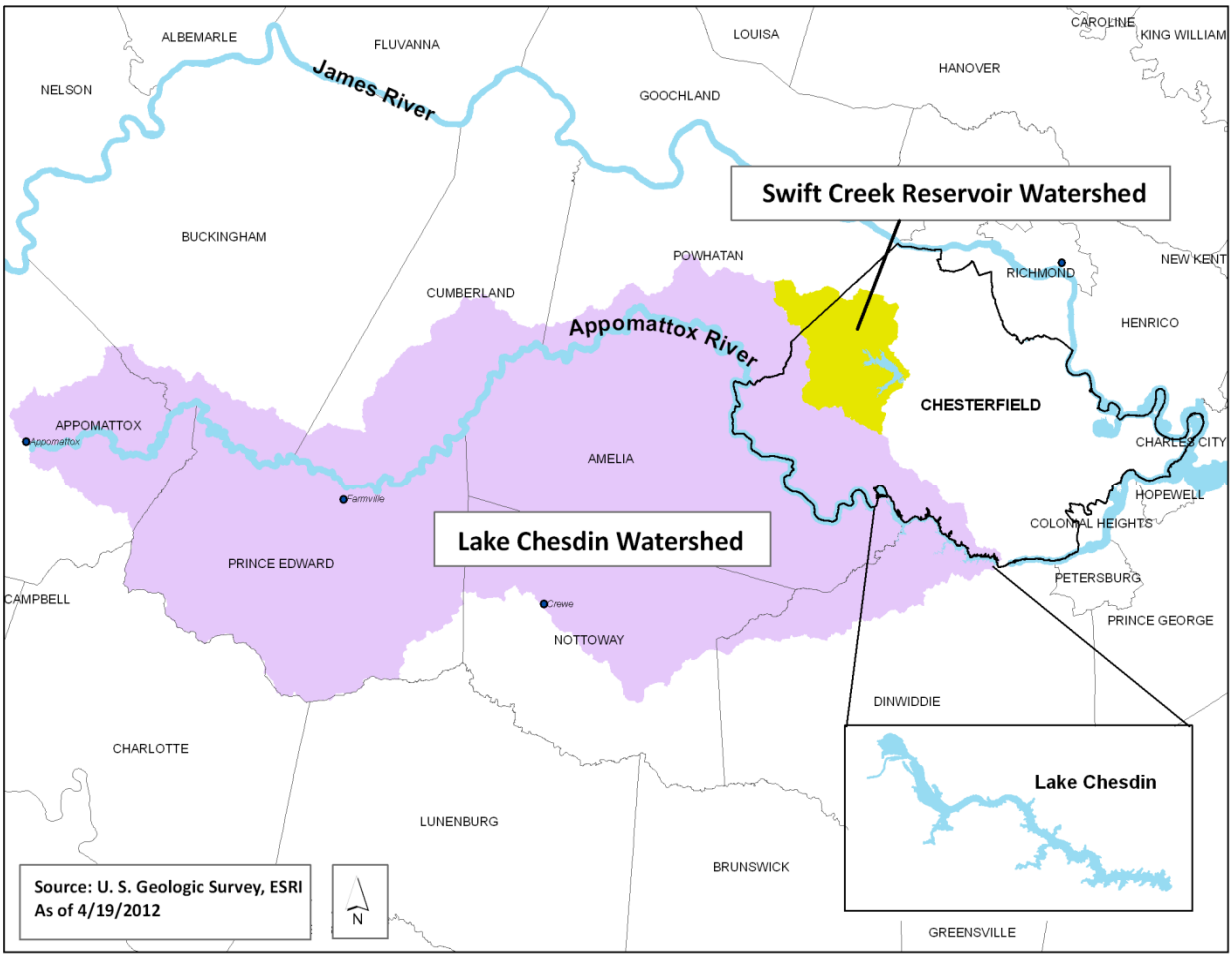
Until 1985, Falling Creek Reservoir was used as a drinking water source. A combination of water quantity and quality issues made it no longer cost effective to use it as a drinking water source. Falling Creek Dam is maintained by the Department of Utilities.

## DRINKING WATER SOURCE WATERSHEDS

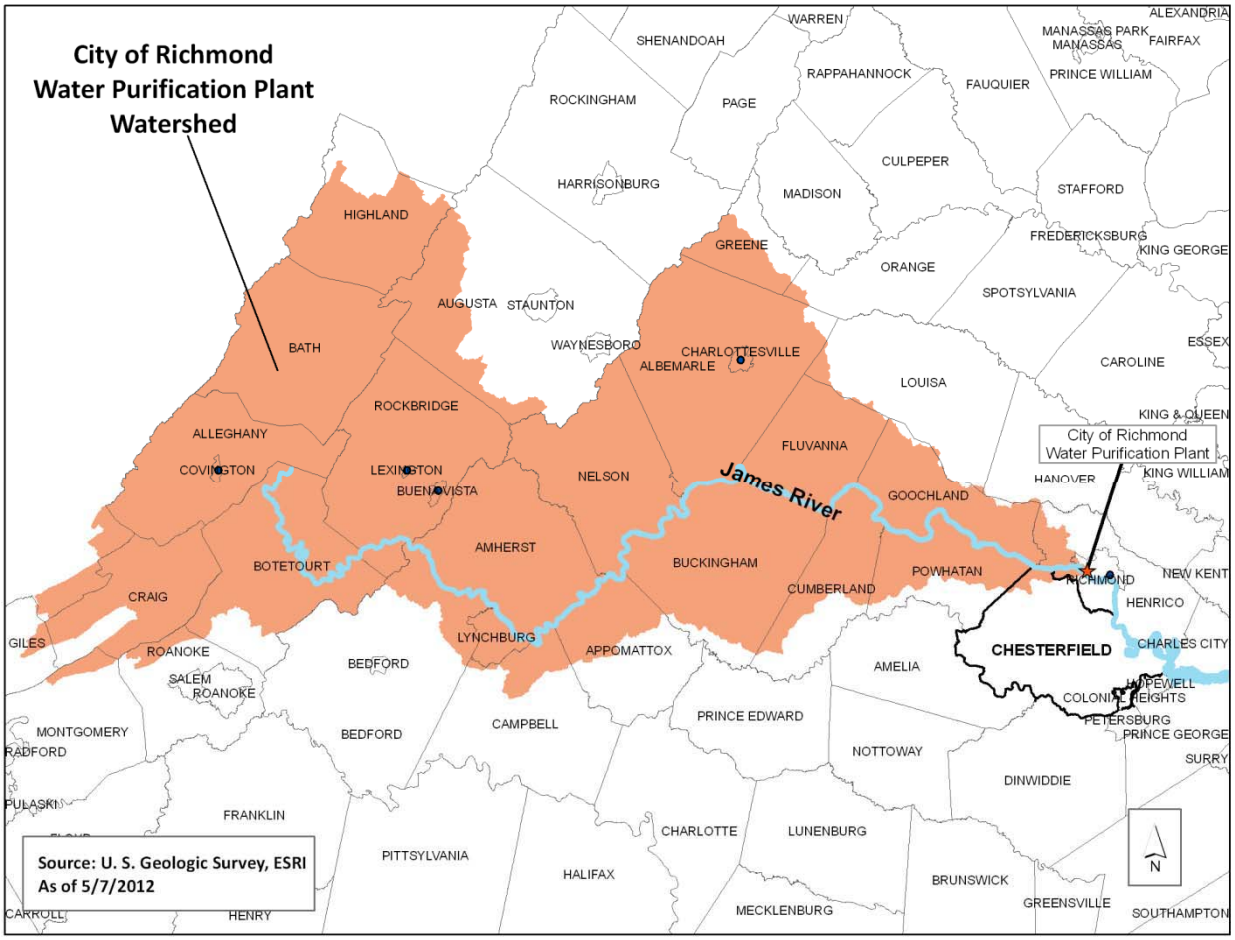
Swift Creek Reservoir, Lake Chesdin and the James River are the drinking water sources for the county; they also provide aesthetic and recreational benefits. More details regarding these water resources for drinking purposes are discussed in the Water and Wastewater chapter.

The Swift Creek Reservoir Watershed comprises approximately 40,000 acres. Approximately 33,000 acres (or 83%) of the watershed lie within the county's boundaries. This enhances the county's ability to protect water quality in the reservoir through proactive measures. The remaining portion of the watershed lies in Powhatan County. The Virginia Marine Resources Commission and the county regulate the permitting of shoreline structures along Swift Creek Reservoir.

The Lake Chesdin Watershed comprises approximately 854,000 acres. Approximately 65,500 acres (or 8%) of the watershed lie within the county's boundaries, limiting the county's ability to significantly affect the water quality of the reservoir. Lake Chesdin is controlled by the Appomattox River Water Authority of which the county is a member. Further discussion of the role of the Authority is outlined in the Water and Wastewater chapter. The Virginia Marine Resources Commission and the Appomattox River Water Authority in coordination with the county regulate the permitting of shoreline structures along Lake Chesdin.



The watershed for the City of Richmond Water Purification Plant on the James River comprises approximately 4.3 million acres. Approximately 8,900 acres (0.2%) of this watershed is within the county's boundaries, limiting the county's ability to significantly affect the water quality of the river. The portions of the James River which border the county lie within the Counties of Henrico and Charles City.




## FLOODPLAINS

Floodplains are areas of land along rivers or streams that are periodically flooded as result of stormwater flows. Floodplains provide storage capacity for excess water until downstream surface water systems can adequately accommodate the flow. The Floodplain Management Ordinance restricts construction in floodplains to prevent the loss of life and property. For the entire county, clearing in floodplains that are part of a Resource Protection Area is limited by the Chesapeake Bay Ordinance. For areas within the Upper Swift Creek Watershed, clearing in floodplains adjacent to non-Resource Protection Area streams is limited by the Upper Swift Creek Ordinance. Floodplains that are left in their natural state benefit water quality by providing a buffer between development and the water body.

### WETLANDS

The United States Army Corps of Engineers defines a wetland as "an area inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal conditions do support, a prevalence of vegetation typically adaptive for life in saturated soil conditions." Wetlands filter pollution, mitigate flooding, provide a source of groundwater recharge and provide habitat for diverse wildlife and plants. Wetlands are protected by regulations administered by the United States Army Corps of Engineers and the Virginia Department of Environmental Quality. The Department of Environmental Engineering addresses wetland protection through the Chesapeake Bay and Erosion and Sediment Control Ordinances**.** The United States Army Corps of Engineers and the Virginia Department of Environmental Quality review and issue permits for disturbance of wetlands. These permits may require mitigation of impacts through stream restorations, provision of compensating wetlands elsewhere, or purchase of credits from a United States Army Corps of Engineers or Virginia Department of Environmental Quality approved wetlands mitigation bank. A mitigation bank is usually a manmade wetland.

## Impacts of Uses and Activities on Water Resources

Most water quality pollution comes from either "point" or "non-point" sources. Point sources of pollution come from an identifiable source such as a pipe outlet from a wastewater treatment plant or industrial use. These discharges are regulated through the Virginia Pollution Discharge Elimination System.

Non-point sources of pollution do not come from an easily identifiable point of discharge. Non-point source pollution occurs when pollutants accumulated on land runoff to state waters during rain events. Examples of non-point pollution are fertilizers, pesticides and sediment.

There are three categories of water pollution:

- **Chemical -** Stormwater runoff from roads and other paved surfaces washes pollutants into nearby waters. Pollutants include motor oil, pesticides, toxic substances, animal waste, pathogens and soils from construction sites. In high concentrations, pollutants can adversely affect aquatic organisms and fish.
- **Physical –** Impervious areas are solid surfaces that resist water penetration. Impervious surfaces cause water to flow in greater volumes and increased speed into stormwater drainage systems or streams than pervious or penetrable surfaces. There is a direct link between increased storm water flows and stream degradation. Increased volumes and faster water flows cause a stream to adjust its shape (widening or down cutting the stream bed and eroding banks), degrading habitat for animals and plants.
- **Biological -** Sediment, chemicals and toxic substances are some of the elements that impact a water body's biology. Changes in a water body's biology impact stream life.

A variety of uses and activities can potentially impact water resources:

- **Land uses:** fertilizers, pesticides, metals, oil, grease and animal waste
- **Construction Sites**: sediment
- **Agriculture:** fertilizers, animal waste and sediment
- **Silviculture or Timbering:** sediment
- **Roads and Parking Lots:** de-icing products, metals petroleum and sediment
- **Golf Courses:** fertilizers, pesticides and herbicides
- **Marinas and Boat Ramps:** petroleum, sewage, trash and sediment
- **Failing Septic Systems:** bacteria
- **Discharges to Storm Sewers or Land:** fertilizers, petroleum and detergents
- **Landfills:** groundwater leachate and surface runoff
- **Hazardous Waste**
- **Underground Storage Tanks:** petroleum
- **Stream Bank and Shoreline Erosion:** sediment and vegetation loss.

## Environmental Regulations for the Protection of Water Quality

Water quality regulations and monitoring programs are in place to protect water quality.

### FEDERAL CLEAN WATER ACT (CWA)

In accordance with the *Federal Clean Water Act*, Virginia has adopted water quality regulations to restore and maintain the chemical, physical and biological integrity of the nation's waters. In Virginia, these programs are administered by the Virginia Department of Environmental Quality and the Virginia Department of Conservation and Recreation under the authority of the State Water Control Law. The Environmental Protection Agency oversees programs designed to control water pollution from industrial or wastewater treatment facilities and stormwater runoff. Pollution control programs include water quality standards, identification of polluted water bodies, protection of wetlands and the issuance of discharge permits.

## VIRGINIA POLLUTION DISCHARGE ELIMINATION SYSTEM (VPDES) AND VIRGINIA WATER POLLUTION PERMIT (VWP)

The Virginia Department of Environmental Quality regulates water resources and pollution. Various permits are required to regulate uses that have the potential to impact water quality, such as industrial activities, wastewater treatment plants, biosolids applications and livestock feeding operations.

## VIRGINIA STORMWATER MANAGEMENT PROGRAM (VSMP)

Based upon the *Clean Water Act*, the Environmental Protection Agency established the Municipal Separate Storm Sewer Systems (MS4) Permit program which requires the county to obtain a storm water permit to eliminate non-storm water discharges and reduce pollutants entering the storm sewer system and water bodies.

The Virginia Stormwater Management Program is administered by the Virginia Department of Conservation and Recreation. The program's regulations address stormwater discharges from lands of federal and local governments, transportation network, institutional and construction sites. As a part of the program, the county enforces the Chesapeake Bay Preservation, Floodplain Management and Erosion and Sediment Control Ordinances. Further, the program addresses stormwater education and outreach, storm sewer maintenance activities, industrial and commercial runoff and screening for non-stormwater discharges into the county's storm sewer system. Non-stormwater discharges into the county's storm sewer system through the Illicit Discharge Ordinance are also monitored.

As a part of the county's Virginia Stormwater Management Program permit, the Watershed Assessment and Stream Protection Program was established in 2002. This program monitors biological, chemical and physical conditions of county streams. The information is used to assess lands draining to the streams and target potential stormwater pollution controls.

## IMPAIRED STREAMS, LAKES AND RIVERS

The Virginia Department of Environmental Quality assesses water quality of the state's streams, lakes and rivers to determine if they are safe for recreation, fishing, wildlife habitat and harvesting shell fish for eating. Further, water bodies used for public drinking water are also assessed. In 2012, an assessment of some county streams, lakes and rivers was made; however, the Environmental Protection Agency which must approve the work of the Virginia Department of Environmental Quality has not completed its review. In 2010, of the 35 water bodies which were completely surveyed, the Virginia Department of Environmental Quality determined that 33 were impaired due to non-compliance with water quality standards. There were other county water bodies which were partially assessed and, as such, a determination as to their quality cannot be made until a full assessment is completed.

A water body is considered impaired if any of the following conditions are found:

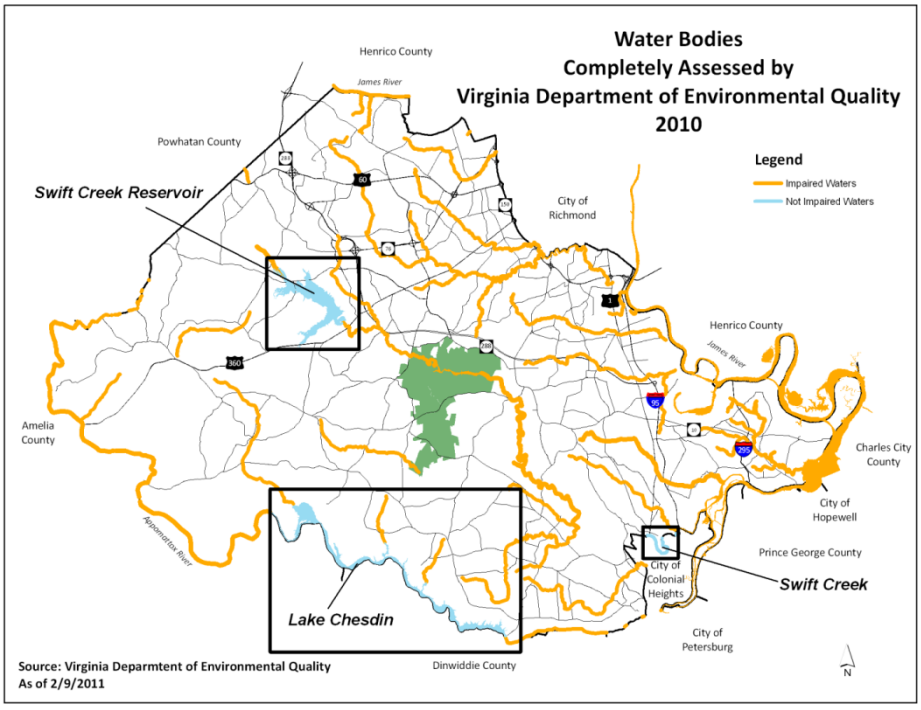
- It fails water quality standards
- Fish or shellfish are contaminated
- Nutrient levels are high
- Aquatic life is declining.

Under the *Clean Water Act*, a Total Maximum Daily Load (TMDL) program must be developed for impaired water bodies. The goal of the program is to attain water quality which is safe for recreational activities, aquatic life and harvesting of fish and shellfish and, in some instances, for use as a public water supply.

Achievement of a Total Maximum Daily Load goal is a three step process:

- Development of a Total Maximum Daily Load program
- Development of a Total Maximum Daily Load Implementation Plan
- Implementation of best management practices identified in the Total Maximum Daily Load Implementation Plan.

In Virginia, attainment of the goals is being led by Virginia Department of Conservation and Recreation. Cooperation of multiple agencies and groups is required, including the: Environmental Protection Agency, Virginia Department of Environmental Quality, Virginia Department of Mines, Minerals and Energy, Virginia Department of Health , Virginia Department of Forestry, Virginia Cooperative Extension, Virginia Department of Agriculture and Consumer Services , Natural Resources Conservation Service, Soil and Water Conservation Districts, Planning District Commissions, local governments, businesses, community watershed groups and citizens.



## CHESAPEAKE BAY PRESERVATION ACT (ACT)

The *Chesapeake Bay Preservation Act*, adopted in 1988, is designed to protect and improve water quality in the Chesapeake Bay and its tributaries by requiring the use of effective conservation planning and pollution prevention practices when using and developing environmentally sensitive lands. The two types of Chesapeake Bay Preservation Areas are Resource Protection Areas and Resource Management Areas.

The county is subject to the *Act* and has, therefore, adopted regulations to control post-development phosphorous runoff from individual sites to 0.45 pounds per acre per year. Development in a Resource Management Area must address water quality protection through preservation of native vegetation to the maximum extent possible, limiting disturbance area during construction to that necessary to accommodate the proposed use and minimizing the amount of impervious cover through the use of best management practices. Uses within a Resource Protection Area are limited to passive recreational uses and water dependent facilities unless exceptions are granted.

- Resource Protection Areas (RPAs) include sensitive environmental features such as a 100 foot naturally vegetated buffer on the landward side of water bodies with perennial flow, tidal wetlands and shores; and nontidal wetlands connected by surface flow that are contiguous to tidal wetlands or water bodies with perennial flow. Resource Protection Areas serve an important water quality function by providing a buffer adjacent to the county water bodies. The buffer acts to filter runoff prior to entering water bodies. The county maintains maps showing resource protection areas.

- Resource Management Areas (RMAs) include the entire county exclusive of Resource Protection Areas.
- Best Management Practices (BMPs) are structural and non-structural methods designed to remove pollutants from runoff, and minimize flooding and stream channel erosion resulting from development. Best Management Practices can include both wet and dry ponds, drainage swales, sand filters, infiltration trenches and manufactured systems.

## UPPER SWIFT CREEK WATERSHED REGULATIONS

In addition to Chesapeake Bay regulations, the county adopted additional practices designed to address development activities within the Upper Swift Creek watershed for the purpose of protecting the water quality of Swift Creek Reservoir, a source of the county's drinking water. Primarily the regulation limits residential subdivision development to a post-development phosphorous load of 0.22 pounds per acre per year. Compliance with this requirement could include:

- Preservation of vegetation, soils and wetlands
- Use of natural drainage features and patterns
- Use of low impact site design techniques
- Use of Best Management Practices.

In conjunction with any zoning application in the Upper Swift Creek Watershed, the Zoning Ordinance requires submission of a Natural Resource Inventory which is an assessment of a site's natural resources such as wetland, floodplains, steep slopes, hydric soils, habitat and other features. The inventory is used to assess appropriate design measures that should be taken to protect the reservoir's water quality.

## EROSION AND SEDIMENT CONTROL ORDINANCE (ESC)

The goal of the Virginia State Erosion and Sediment Control Ordinance is to control soil erosion, sedimentation and nonagricultural runoff from regulated "land-disturbing activities" to prevent degradation of property and natural resources. The county implements the Virginia State Erosion and Sediment Control Ordinance. The regulations specify "Minimum Standards" which include criteria, techniques and policies that must be followed for all regulated activities. These standards address erosion and sediment control measures as well as control stormwater runoff to ensure that the limits of 100 year floodplains will not be exceeded on roads and storm sewer structures.

## FUTURE STATE REGULATIONS

In 2014, the county will be required by the state to adopt new water quality regulations. These new requirements will most likely be more stringent than existing regulations and could combine water quality regulations under one umbrella. It is anticipated that the changes will further limit phosphorous runoff and will require that managed turf, such as lawns, be included in pollutant calculations. Current standards only address impervious surfaces such as parking lots and structures. The standards will also provide additional options for best management practices for filtering runoff such as preservation of natural open space and allowing runoff to cross pervious areas rather than being directed to paved surfaces.

## General Environment Guidelines

The General Environment Guidelines provide direction for development and land use decisions as they relate to environmental resources.

Major considerations in the development of these guidelines include:

- ❖ Acknowledging existing regulations regarding water quality, floodplains and soils.
- ❖ Promoting protection of land, surface water and groundwater resources for drinking, aesthetic and recreational purposes.
- ❖ Encouraging the incorporation of environmental resources as amenities in new development.
- ❖ Supporting adaptive reuse of land resources formerly occupied by activities such as quarries and landfills.

The following General Environment Guidelines should be used when addressing environmental protection:

- ➢ **Development Integration of Environmental Resources.** Encourage development designs which accommodate and incorporate environmental resources as amenities.

- ➢ **Innovative Development.** Encourage innovative approaches, designs and practices that protect and enhance environmental resources in new developments. When the guidelines of The Land Use Plan are followed, approaches could include: reduced lot sizes in return for preservation of open space; connectivity of resources; and appropriate recreational uses that make use of these resources.

- ➢ **General Development Standards.** Encourage use of innovative development standards and practices that mitigate the impact of stormwater runoff on water quality such as:
  - Low impact design features
  - Limitations on the amount of land cleared during site development at any given time
  - Retrofitting best management practices in older neighborhoods
  - Use of manufactured best management practices
  - Use of best management practices in series
  - Development of contingency plans for hazardous spills
  - Preservation of trees
  - Preservation of vegetation in floodplains.

- ➢ **Golf Course Development Standards.** Consider measures to reduce runoff of fertilizers and pesticides from golf courses, and direct stormwater to best management practices.

- ➢ **Land Use Transitions.** For developments not located within mixed use areas, consider use of environmental features as transitions between different land uses, in accordance with the recommendations of The Land Use Plan.

- **Erosion and Sediment Control.** Encourage greater erosion and sediment control measures during development.

- **Stream and Shoreline Erosion.** Encourage greater protection, restoration and stabilization of streams and shorelines.

- **Steep Slopes.** Encourage preservation of slopes of 20 percent or greater adjacent to natural drainageways.

- **Education.** Consider enhancement and expansion of community, school and library outreach programs to educate the public of daily practices that protect and enhance water resources.

- **Preservation of Resources through Cooperative Efforts.** Encourage public and private cooperation in the preservation and use of environmental resources such as conservation and open space easements and park and recreational uses.

- **Preservation of Resources through Funding Efforts.** Seek funding opportunities for acquiring land and resources that benefit the public.

- **Retrofitting Existing Water Conveyance Systems.** Seek funding to correct environmental deficiencies by retrofitting and establishing stormwater quality facilities.

- **Energy Conservation.**

  - In accordance with The Land Use Plan, promote mixed use developments which incorporate residential and non-residential uses, thereby promoting opportunities for various methods of transportation.

  - Encourage incorporation of energy efficiency in construction and rehabilitation that reduces costs for the owner or renter.

  - Promote developments that incorporate alternative energy sources such as geothermal, solar and wind.

- **Protect Drinking Water Sources.** Support water quality protection measures through the Chesapeake Bay Ordinance, Municipal Separate Storm Sewer System, Erosion and Sediment Control Ordinances and the Upper Swift Creek Watershed regulations.

- **Agricultural and Forestry Uses.** Provide for the preservation of agricultural and forestry uses by supporting conservation and open space easements, tax incentives and programs such as acquisition of development rights which promote rural preservation and support uses such as agri-tourism, farmer's markets, wineries, equestrian activities, community gardens and agricultural festivals.

- **Timber Harvesting to Accommodate New Development.** Consider provisions of adequate erosion and sediment controls for timbering activities related to new land development.

- **Mineral Resource Extractions and Landfills.** Consider the impacts of:
  - New mineral extractions and landfill proposals on existing and future land uses.
  - Existing and former mineral extractions and landfill operations on new development in the vicinity of the operations.
  - Consider proper and safe closure of sites to mitigate long term impacts.
  - Discourage residential development in proximity to mineral extractions and landfills.
  - Discourage new mineral extractions and landfills in proximity to existing and future residential development.
  - Consider methods to notify future property owners of sites previously used for mineral extractions and landfills of past activities and their potential impacts on future land uses.
  - Encourage the adaptive reuse of former quarries and landfills.

- **River Corridors.** Promote preservation and enhancement of the scenic, historic, natural and open space qualities of the James and Appomattox Rivers.

- **Waterfront Access.** Support proposals for waterfront access while considering potential water quality impacts of water dependent uses such as docks, piers, boat ramps and marinas.